'alidation of GPS Occultation Data for Climate Research

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We present some results of the ongoing validation effort of GPS/MET data at JPL. The GPS/MET project, managed by the Universities Corporation for Atmospheric Research (UCAR), is the pilot study of the technique of measuring atmospheric temperature and pressure by radio occultation using the Global Positioning System (GPS). By using software systems alread y in place at J PL, we have inverted several hundred of the atmospheric occultations recorded by GPS/MET and have begun a study of how accurately these occultations measure temperature and pressure in the lower atmosphere. Initial accuracy estimates suggest that GPS occultations offer a valuable ncw method for detecting global climate signals.

We have compared retrievals of temperature and pressure profiles from GPS/MET occultations to output from the European Centre for Medium-range Weather Forecasts (ECMWF) global model and stratosphere analyses from the National Meteorological Center (N MC). We have found that our temperature retrievals (vs. pressure) show no bias with respect to the ECMWF global model and standard deviations on the order of 1 to 2 K throughout the middle and upper troposphere. Furthermore, we have found that the occultation retrievals can contribute valuable information where the model has little or no data to Assimilate. In the tropics, the occultations show evidence of a pronounced wavelike structure in the lower stratosphere, most probably Rossby-gravity wave. Our comparisons with the NMC stratosphere analyses arc preliminary, but agreement with the occultation retrievals seems good, especially in the northern hemisphere.

GPS occultation measurements of geopotential heights of constant pressure surfaces offer a powerful ncw method to detect secular trends ı the global climate. First, comparisons to the ECMWF global model output and NMC stratosphere analyses show that biases are on the order of 20 gpm and that standard deviations are on the order of 30 r pm. This demonstrates that occultation measurements arc accurate enough to detect secular climate trends since a tropospheric warming of K implies a 70 meter expansion of the troposphere. Secondly, geopotential heights measured by occultations arc independent of dynamical activity at low altitudes and the orography of the surface. Thirdly, occultations measurements can be obtained nearly uniformly over the globe. All of these considerations make occultations an outstanding candidatc for detection of global climate trends.

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